COMMERCIAL STANDARD CS45-55

FOR

DOUGLAS FIR PLYWOOD

(Ninth Edition—Supersedes CS45-48)

A Recorded Voluntary Standard of the Trade

Effective Date for New Production from February 1, 1955

Established through

U. S. DEPARTMENT OF COMMERCE
Sinclair Weeks, Secretary

NATIONAL BUREAU OF STANDARDS
A. V. Astin, Director

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1. PURPOSE

1.1 Because of the extended application of Douglas fir plywood to a large number of new uses, the standard grading rules given herein are offered as a universal basis of understanding in the industry. General adoption and use of this standard will facilitate procurement of the proper grade of material and the proper type as to moisture resistance for its varied uses, and provide a better understanding between buyer and seller. Architects, engineers, contractors, industrial users, and home owners will thus be able to specify their needs from nationally accepted grading standards.

2. SCOPE

2.1 These rules cover seven grades and two special items of Interior type and seven grades of Exterior type Douglas fir plywood, which is a laminated board suitable for paneling, sheathing, subflooring, exterior siding, concrete forms, cabinet work, and many other structural and industrial uses. The standard includes tests, standard sizes, size tolerances, reinspection rules, grade-marking provisions, and nomenclature and definitions. It also provides descriptions and rules governing the manufacture of overlaid plywood.

3. DEFINITION

3.1 Douglas fir plywood is a built-up board of laminated veneers in which the grain of each piece is at right angles to the one adjacent to it. The kiln-dried veneer is united under high pressure with a bonding agent, making the joints as strong as or stronger than the wood itself. The alternating direction of the grain of each contiguous layer of wood equalizes the strains, and in this way minimizes shrinkage and warping of the product and prevents splitting. Overlaid plywood is produced in a like manner with the special facings added.

4. REQUIREMENTS

4.1 **Workmanship.**—Unless otherwise specified, plywood shall be sanded on two sides to meet requirements of veneer as set forth in paragraph 4.4.4. When specified rough or unsanded, plywood may have paper tape on either face or back, or both. It shall be well manufactured and free from blisters, laps, and defects, except as permitted in the specific rules for the various grades. Exposed veneer on both sides of panel shall have bark or tight surface out. Plies directly under surfaces of overlaid panels are not considered exposed veneers.

4.2 **Bonding.**—The entire area of each contacting surface of the plywood shall be bonded in an approved manner with material best adapted to each use classification. No tape shall be used in any glue line.

4.3 **Loading or Packing.**—The plywood shall be securely loaded or packed to insure delivery in a clean and serviceable condition.

4.4 **Types of Plywood.**—Douglas fir plywood is made in two types, Interior (Int.) and Exterior (Ext.), with the type referring to the moisture resistance of the adhesives bonding the plies together. Within each type there are several grades, which are established by the quality of the veneer on both faces of the panel as hereinafter defined. The grade descriptions set forth the minimum requirements, and, therefore, the majority of panels in any shipment will exceed the specification given.

4.4.1 **Moisture Content.**—Moisture content of panels at time of shipment from mill shall not exceed 18% of dry weight as determined by oven-dry test.

4.4.2 **Veneers.**—Veneers shall be 1/12 in. or more thick before sanding in panels 1/4 in. and thicker, except that veneers 1/16 in. thick before sanding may be used in 5-ply, 3/8 in. thick Exterior type panels. The veneer in any particular classification, as set forth in paragraph 4.4.4, shall not contain any defect larger than those permitted specifically therein, or that will significantly impair either the strength or the serviceability of the panel. Sound, firm stain shall not be considered a defect.

4.4.3 **Ring Count.**—A minimum of six annular rings per inch, as measured in block at time of peeling, shall be required for both faces of all grades.

4.4.4 **Veneer Classifications.**—All veneers used in the different plywood grades shall be one of the following (grade A being the best of the four veneers):

4.4.4.1 **Grade A** veneer shall be of one or more pieces of firm, smoothly cut veneer. When of more than one piece, the pieces shall be well

joined. The veneer shall be free from knots, open splits, pitch pockets, and other open defects. Pitch streaks averaging not more than 3/8 in. in width and blending with color of wood, discolorations, sapwood, shims, and neatly made patches shall be admitted, but not more than 18 veneer patches shall occur in any 4 ft. x 8 ft. **A** face, with proportionate limits for other sizes of panels. Shims may not be used over or around patches. Any multiple repair in a panel shall be limited to two patches. All patches and repairs must run parallel to the grain. However, approved plastic fillers may be used to fill small cracks or checks not more than 1/32 in. wide; to fill small splits or openings up to 1/16 in. wide, if not exceeding 2 in. in length, and also to fill small chipped areas or openings not more than 1/8 in. wide by 1/4 in. long. This grade shall present a smooth surface suitable for painting.

4.4.4.2 **Grade B** veneer shall present a solid surface, free from open defects except as noted, but in addition to characteristics admitted in Grade **A**, veneer shall admit also neatly made circular plugs, as well as synthetic plugs that present solid, level, hard surfaces, knots up to 1 in. if both sound and tight, splits not wider than 1/32 in., slightly rough but not torn grain, and other minor sanding and patching defects, including sander skips not exceeding 5% of panel area. Tiny vertical holes not exceeding 1/16 in. in diameter caused by ambrosia beetles are admissible if not exceeding an average of one per square foot in number; also admissible are horizontal or surface tunnels, which shall be limited to 1/16 in. across, 1 in. in length, and to 12 in number in a 4 ft. x 8 ft. panel, or proportionately in panels of other dimensions.

4.4.4.3 **Grade C** veneer may contain knotholes not larger than 1 in. in least dimension; open pitch pockets not wider than 1 in.; splits not wider than 3/16 in. that taper to a point; worm or borer holes not more than 5/8 in. wide or 1 1/2 in. long; knots if tight and not more than 1 1/2 in. in least dimension; and plugs, patches, shims, sanding defects, and other characteristics in number and size that will not impair the serviceability of the panel.

4.4.4.4 **Grade D** veneer (may be used only in Interior type panels) shall contain no knotholes greater than 2 1/2 in. in maximum dimension, no pitch pockets more than 2 in. wide by 4 in. long, or of equivalent area if of lesser width, and no splits wider than 1/2 in. Splits 1/2 in. wide at widest point may be one-fourth-panel length; those not more than 1/4 in. wide at widest point may be half-panel length; and those not more than 3/16 in. wide may be full-panel length, but all splits shall taper to a point at one end. Any number of plugs, patches, shims, worm or borer holes, sanding defects, and other characteristics are permitted provided they do not seriously impair the strength or serviceability of the panel.

4.4.5 **Overlays.**—Overlaid plywood is Douglas fir plywood to which has been added resin-impregnated fiber faces on one or both sides. It is made in two types, High Density and Medium Density, with the type referring to the surfacing material as hereinafter defined. The resin-impregnated faces are permanently fused to the base panel under heat and pressure. Although designed for either exterior or interior service, all overlaid plywood is made in the Exterior type. This refers to the adhesive bond between plies, between the overlay surface and the base panel, and to the durability of the surface itself.

4.4.5.1 **High Density Type.**—The surfacing on the finished product shall be hard, smooth, and of such character that further finishing by paint or varnish is not required. It shall consist of a cellulose-fiber sheet or sheets, in which not less than 40 percent by weight of the laminate shall be a thermo-setting resin of the phenol or melamine type. The resin-impregnated material shall be not less than 0.009 in. thick and shall weigh not less than 60 pounds per 1,000 square feet of single face, including both resin and fiber. The resin impregnation shall be sufficient to attach the surfacing material to the plywood. This bond shall be equal in performance to the glue lines between the sheets of veneer which make up the plywood. The overlay face usually comes in natural translucent color, but certain other colors are available or may be used by manufacturers for identification.

4.4.5.2 **Medium Density Type.** — The resin-impregnated facing on the finished product shall present a smooth, uniform surface suitable for high-quality paint finishes. It shall consist of a cellulose-fiber sheet in which not less than 20 percent by weight of the laminate shall be a thermosetting resin of the phenol or melamine type. The resin-impregnated material shall be not less than 0.012 in. thick and shall weigh not less than 65 pounds per 1,000 square feet of single face, including both resin and fiber. An integral phenolic resin glue line shall be applied to one surface of the facing material to bond it to the plywood. This bond shall be equal in performance to the glue lines between the sheets of veneer which make up the plywood. The overlay face shall be a solid color. Some evidence of the underlying grain may appear, but, compared to the nature of the "high density" surface, there shall be no consistent show-through.

4.5 **Interior Type Plywood.**—This type of plywood has a high degree of moisture resistance and is suitable for constructions where its application requires that it shall retain its original form and practically all its strength when occasionally subjected to a thorough wetting and subsequent normal drying; it is also suitable for constructions where subjected to occasional deposits of moisture by condensation through walls or leakage, or from other sources. All veneer used in Interior type shall be of Douglas fir, except that Western hemlock, Sitka spruce, noble fir, commercial white fir, Alaska cedar, Port Orford cedar, California redwood, ponderosa pine, sugar pine, Idaho white pine, and Western larch may be used for inner plies only, in Interior type grades **A-A, A-B, A-D, B-D,** and the special "natural finish" items (see table 1). Plywood of this type shall meet the test requirements set forth in paragraphs 5.2 and 5.4.1. This type is available in the grades given in table 1.

NOTE: Interior Sheathing, Underlayment, and Concrete Form grades shall be made with an adhesive possessing a mold resistance equivalent to that created by adding 5 pounds of pentachlorophenol, or its sodium salt, per 100 pounds of dry glue base to plain protein glues.

Table 1. Interior Type Grades—Minimum Quality of Veneers

Grade	Face	Back	Inner Plies	Additional Limitations[1]
A-A, Int.	A	A	D	Sanded 2 sides.
A-B, Int.	A	B	D	Sanded 2 sides.
A-D, Int.	A	D	D	Sanded 2 sides.
B-D, Int.	B	D	D	Sanded 2 sides.
C (Repaired)-D, Int. (Underlayment, Int.)	C (Repaired)[2]	D	C[3] or D	Sanded 2 sides.
C-D, Int. (Sheathing, Int.)	C	D	D	Unsanded grade. No belt sanding permissible.
B-B, Int. (Concrete Form, Int.).[4]	B	B	C (All Inner Plies).	Edge-sealed and, unless otherwise specified, mill-oiled. Sanded 2 sides.
N-D, Int. (Natural Finish One Side).[5]	Special[5]	D	D	Sanded 2 sides.
N-N, Int. (Natural Finish Two Sides).[6]	Special[6]	Special[6]	B[7]	Sanded 2 sides.

[1]See also paragraphs 4.4 and 4.5.

[2]Face may contain knotholes, worm or borer holes, and other open defects not larger than 1/4 by 1/2 in., sound and tight knots up to 1 1/2 in. in greatest dimension, splits up to 1/16 in. wide, ruptured and torn grain, sander skips up to 5 percent of panel area, pitch pockets if solid and tight, plugs, patches, and shims.

[3]Veneer immediately adjacent to face shall be **C** or better.

[4]B-B, Int., unless ordered as a Concrete Form grade or edge-sealed, may be furnished with **D** inner plies.

[5]A special order "one side Natural Finish" item, not generally available in stock, intended primarily for paneling and wainscoting, generally only in 1/4 in. thickness. Available only from certain mills. The face shall consist of smoothly cut veneer of 100 percent heartwood free from knots, splits, pitch pockets, and other open defects; not more than 3 pieces of veneer shall be used, and they shall be well matched as to color and grain. Faces shall be of a yellow or pinkish color without stain. Two shims, neither longer than 6 in., that occur only at the ends of panels, and not more than 4 inconspicuous well-matched small patches not to exceed 3/8 in. wide by 2 1/2 in. long shall be admitted. All repairs and all veneer joints shall be parallel to the edges of the panel. No overlapping of repairs is permitted. In all other respects the panel shall conform to an Interior type A-D panel.

[6]Also a special order "two sides Natural Finish" item, intended primarily for cabinet work, generally only in 3/4 in. thickness. Available only from certain mills. Each face shall consist of veneer equivalent to face described in footnote 5.

[7]All inner plies shall consist of **B** veneer with crossbands jointed.

4.6 **Exterior Type Plywood.**—This type represents the ultimate in moisture resistance—a plywood that will retain its original form and strength when repeatedly wet and dried and otherwise subjected to the elements, and which is suitable for permanent exterior use. It shall be free from both core gaps and core voids that impair the strength or serviceability of the panel. All repatches and shims shall be set wtih adhesives meeting performance standards for Exterior plywood. All veneer used in Exterior type panels shall be of Douglas fir and of **C** grade as defined in pargraph 4.4.4 or better. All Exterior panels shall be so designated by a distinctive symbol "Ext" branded or stamped on the edge of each panel. Plywood of this type shall meet the test requirements set forth in paragraphs 5.3, 5.4.2, and 5.4.3. This type is available in the grades given in table 2.

Table 2. Exterior Type Grades—Minimum Quality of Veneers

Grade	Face	Back	Inner Plies	Additional Limitations[1]
A-A, Ext.	A	A	C	Sanded 2 sides.
A-B, Ext.	A	B	C	Sanded 2 sides.
A-C, Ext.	A	C	C	Sanded 2 sides.
B-C, Ext.	B	C	C	Sanded 2 sides.
C (Repaired)-C, Ext. (Underlayment, Ext.).	C (Repaired)[2]	C	C	Sanded 2 sides.
C-C, Ext. (Sheathing, Ext.)	C	C	C	Unsanded grade. No belt sanding permissible.
B-B, Ext. (Concrete Form, Ext.)	B	B	C	Edge-sealed and, unless otherwise specified, mill-oiled. Sanded 2 sides.

[1]See also paragraphs 4.4 and 4.6.

[2]Face may contain knotholes, worm or borer holes, and other open defects not larger than 1/4 by 1/2 in., sound and tight knots up to 1 1/2 in. in greatest dimension, splits up to 1/16 in. wide, ruptured and torn grain, sander skips up to 5 percent of panel area, pitch pockets if solid and tight, plugs, patches, and shims.

Table 3. Overlaid Plywood — Minimum Quality of Veneers

Grade	Face[1]	Back[1]	Inner Plies
A-A, Ext.—High Density Overlay	A	A	B
B-B, Ext.—High Density Overlay	B	B	B
B-B, Ext.—High Density Concrete Form Overlay	B	B	B
B-B, Ext.—Medium Density Overlay	B	B	B
B-B, Ext.—Medium Density Concrete Form Overlay	B	B	B

[1]For overlaid plywood the grade designation for face or back refers to the veneer directly underlying the surface. All overlaid plywood is surfaced on 2 sides unless otherwise specified. When only 1 side is surfaced, the exposed back may be **C** or better.

5. SAMPLING AND TESTING

5.1 **Sampling.**—Ten test panels shall be taken at random from any shipment. Test panels shall be selected to represent as many variations in grades and thicknesses as possible. Test panels shall also be selected from locations distributed as widely as is practicable throughout the shipment. From each Exterior panel selected, three test pieces shall be cut at random and from each test piece ten test specimens shall be cut. From each Interior panel selected, a 6 in. x 6 in. test piece shall be cut from each end approximately at mid-width of the panel, and from each edge approximately at mid-length of the panel, while a fifth piece shall be cut from somewhere near the middle or center of the panel. Overlaid plywood shipments shall be sampled in the same manner as Exterior plywood.

5.2 **Test for Interior Type.**—The test pieces shall be submerged in water at room temperature for a period of 4 hours, and then dried at a temperature not to exceed 100° F for a period of 20 hours. This cycle shall be repeated until all samples have failed, or have completed 15 cycles.

5.3 **Test for Exterior Type.**

5.3.1 **Cold Soaking Test.**—Five shear specimens shall be cut from each test piece as shown in figure 1.

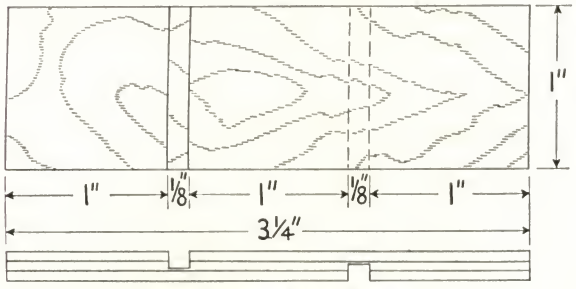


Figure 1.—Shear Specimen.

If the number of plies exceeds 3, the cuts shall be made so as to test any two of the joints, but the additional plies need not be stripped except as demanded by the limitations of the width of the retaining jaws on the testing device. When desired, special jaws may be constructed to accommodate the thicker plywood. If the number of plies exceeds 3, the choice of joints to be tested shall be left to the discretion of the inspector, but at least one-half of the tests shall include the innermost joints. The specimens shall be submerged in water at room temperature for a period of 48 hours and dried for 8 hours at a temperature of 145° F (±5° F), and then followed by two cycles of soaking for 16 hours and drying for 8 hours under the conditions described above. The shear specimens shall be soaked again for a period of 16 hours and tested while wet in a shear-testing device (as illustrated in figure 2) by placing them in the jaws of the device, to which a load shall be applied at the rate of 600 to 1,000 pounds a minute until failure. The percentage of wood failure of the specimens shall be estimated.

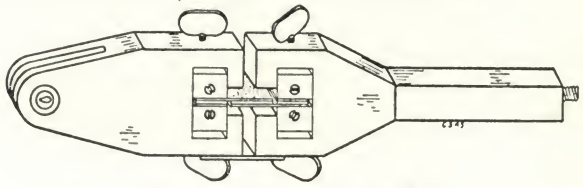


Figure 2.—Jaws for Shear Test

Overlaid plywood shall be evaluated in an identical manner, but in addition to estimating wood failure at the plywood glue lines tested, specimens shall be examined for separation of the resin-impregnated face from the plywood.

5.3.2 **Boiling Test.**—Shear specimens shall be taken as described in paragraph 5.3.1, boiled in water for 4 hours, and then dried for 20 hours at a temperature of 145° F (±5° F). The shear

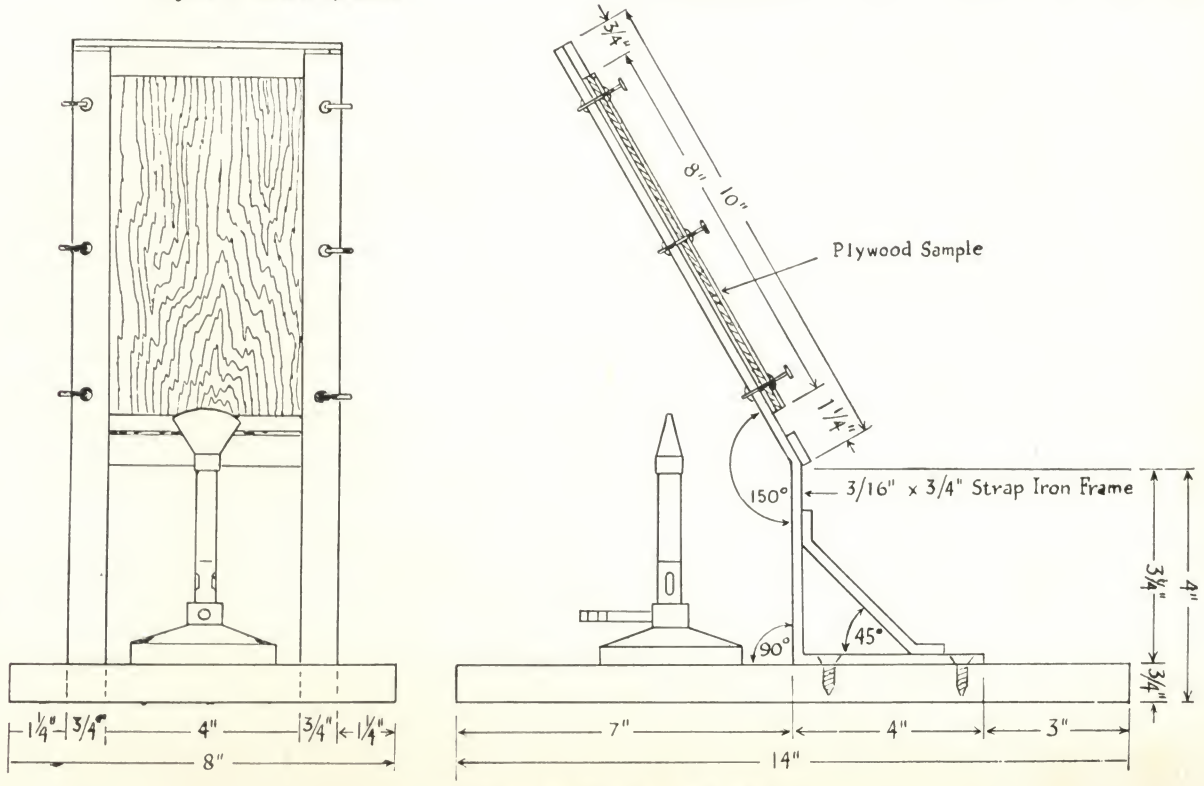


Figure 3.—Apparatus for Fire Test.

specimens shall be boiled again for a period of 4 hours and tested while wet, as described in paragraph 5.3.1. The percentage of wood failure of the specimens shall be estimated.

Overlaid plywood shall be subjected to the above cycles and evaluated as described in paragraph 5.3.1.

5.3.3 **Fire Test.**—A 5 1/2 in. x 8 in. piece shall be taken from each of five selected test panels and shall be placed on the stand as illustrated in figure 3, and subjected to a 800° to 900° C flame from a Bunsen-type burner for a period of 10 minutes or, in the case of a thin specimen, until a brown char area appears on the back side. The burner shall be equipped with a wing top to envelop the entire width of the specimen in flame. The top of the burner shall be 1 in. from the specimen face and the flame 1 1/2 in. high.

The flame shall impinge on the face of the specimen 2 in. from the bottom end. After the test the sample shall be removed from the stand and the glue lines examined for delamination by separating the charred plies with a sharp chisel-like instrument. Any delamination due to combustion shall be considered as failure, except when occurring at a localized defect permitted in the grade. When testing overlaid plywood, blisters or bubbles in the surface caused by combustion shall not be considered delamination.

5.4 **Interpretation of Tests.**

5.4.1 **Interior Type.**—Total visible delamination of 1/4 in. or more in depth, and over 2 in. in

Table 4. Standard Stock Douglas Fir Plywood Sizes—Interior Type

Grade	Width (in.)[1]	Length (in.)[1]	Thickness (in.)[2, 3, 4]				
A-A, Int.	36	72	1/4	---	---	---	3/4
		96	1/4	3/8	1/2	---	3/4
A-A, Int.	48	72	1/4	3/8	1/2	5/8	3/4
		84	1/4	3/8	1/2	5/8	3/4
		96	1/4	3/8	1/2	5/8	3/4
		108	1/4	3/8	---	---	3/4
		120	1/4	3/8	1/2	5/8	3/4
		144	1/4	---	---	---	3/4
A-B, Int.	36	96	1/4	3/8	1/2	5/8	3/4
A-B, Int.	48	72	1/4	3/8	1/2	5/8	3/4
		84	1/4	3/8	1/2	5/8	3/4
		96	1/4	3/8	1/2	5/8	3/4
		108	1/4	---	---	---	3/4
		120	1/4	3/8	1/2	5/8	3/4
		144	1/4	---	---	---	3/4
A-D, Int.	30	60	---	---	---	---	3/4
		72	---	---	---	---	3/4
		84	1/4	---	---	---	3/4
		96	1/4	---	---	---	3/4
		120	---	---	---	---	3/4
A-D, Int.	36	60	---	---	---	---	3/4
		72	1/4	3/8	1/2	5/8	3/4
		84	1/4	3/8	1/2	5/8	3/4
		96	1/4	3/8	1/2	5/8	3/4
		120	1/4	---	---	---	3/4
A-D, Int.	48	60	1/4	3/8	1/2	5/8	3/4
		72	1/4	3/8	1/2	5/8	3/4
		84	1/4	3/8	1/2	5/8	3/4
		96	1/4	3/8	1/2	5/8	3/4
		108	1/4	3/8	1/2	5/8	3/4
		120	1/4	3/8	1/2	5/8	3/4
		144	1/4	3/8	1/2	5/8	3/4
B-B (Concrete Form, Int.)	48	96	---	---	---	5/8	3/4
B-D, Int.	48	84	1/4	3/8	1/2	5/8	3/4
		96	1/4	3/8	1/2	5/8	3/4
C (Repaired)-D (Underlayment, Int.)	48	96	1/4	3/8	1/2	5/8	3/4
C-D (Sheathing, Int.), unsanded	48	96	5/16	3/8	1/2	5/8	3/4
		120	5/16	---	---	5/8	---

[1]A tolerance of 1/32 (0.0312) in. over or under the specified width and/or length shall be allowed, but all panels, including overlays, shall be square within 1/8 (0.125) in. All panels shall be sawn so that a straight line drawn from one corner to the adjacent corner shall fall within 1/16 in. of panel edge.

[2]A tolerance of 1/64 (0.0156) in. over or under the specified thickness shall be allowed on sanded panels, and a tolerance of 1/32 (0.0312) in. on unsanded and overlaid panels.

[3]Minimum number of plies required for standard construction:
3 plies for 1/4-, 5/16-, and 3/8-in.
5 plies for 1/2-, 5/8-, and 3/4-in.
7 plies for 7/8- to 1 3/16-in.

[4]Sanded 2 sides, except C-D (Sheathing).

Note.—Any size panel conforming in all other respects to the various requirements of this standard shall be considered as conforming to this standard.

length along the edge of a 6-in. x 6-in. test piece shall be considered as failure. When delamination occurs at a localized defect permitted within the grade, that test piece shall be discarded. The average number of cycles which the test pieces shall withstand is ten or more, and at least 85% of the specimens shall withstand three cycles. If the test pieces fail to meet these requirements, an additional ten panels shall be selected and tested as described in paragraphs 5.1 and 5.2. Then the test pieces from both groups of ten, considered together, shall meet the above test requirements.

5.4.2 **Exterior Type.** — Specimens cut through localized defects permitted in the grade shall be discarded. A test piece shall be rated by the combined results of both the cold soaking test and the boiling test—generally ten specimens in all. If the average wood failure of the ten specimens is below 60 percent, or if more than one of the specimens is below 30 percent, the test piece fails. If more than one test piece fails, that panel fails. If one or none of the ten panels fails, the shipment is accepted; if more than two fail, the shipment is rejected. If two fail, another series of ten panels is tested. If one or none of the panels fails in this series, the shipment is accepted; otherwise it is rejected. If the average wood failure of the first ten panels is less than 80 percent, a second series of ten is tested regardless of the number of failures. If the average wood failure of the twenty panels combined is less than 80 percent, the shipment is rejected.

The same interpretation shall apply to overlaid plywood. In addition, separation of the resin-impregnated face from the plywood shall be considered failure.

5.4.3 If more than one panel fails the fire test, the shipment may be rejected; if one panel fails, a second series of five shall be tested, all of which must pass.

6. STANDARD STOCK SIZES[1]

6.1 Douglas fir plywood is commonly made in the sizes listed in tables 4, 5, and 6, but other sizes, including 4-, 14-, and 16-foot lengths, may also be available from mills on order.

[1] Sizes most commonly available from distributors.

7. INSPECTION

7.1 All plywood guaranteed to conform to the Commercial Standard grading rules is sold subject to inspection in the white only, except concrete-form material, which may have a priming of oil or other preparation before shipment. All complaints regarding the quality of any shipment must be made within 15 days from receipt thereof.

7.2 If the grade of any plywood shipment is in dispute and a reinspection is demanded, the cost of such reinspection shall be borne by the seller and the shipment settled for on the basis of the

Table 5. Standard Stock Douglas Fir Plywood Sizes—Exterior Type

Grade	Width (in.)[1]	Length (in.)[1]	Thickness (in.)[2, 3, 4]						
A-A, Ext.	48	60	1/4	3/8	1/2	5/8	3/4	---	---
		84	1/4	3/8	1/2	5/8	3/4	---	---
		96	1/4	3/8	1/2	5/8	3/4	7/8	1
		108	1/4	3/8	1/2	5/8	3/4	---	---
		120	1/4	3/8	1/2	5/8	3/4	---	---
		144	1/4	3/8	1/2	5/8	3/4	---	---
A-B, Ext.	48	84	1/4	3/8	---	---	3/4	---	---
		96	1/4	3/8	1/2	5/8	3/4	---	1
		120	1/4	3/8	1/2	5/8	3/4	---	---
		144	1/4	3/8	1/2	---	3/4	---	---
A-C, Ext.	36	96	1/4	3/8	1/2	5/8	3/4	---	---
A-C, Ext.	48	72	1/4	3/8	1/2	5/8	3/4	---	---
		84	1/4	3/8	1/2	5/8	3/4	---	---
		96	1/4	3/8	1/2	5/8	3/4	---	1
		108	1/4	3/8	1/2	5/8	3/4	---	---
		120	1/4	3/8	1/2	5/8	3/4	---	---
		144	1/4	3/8	1/2	5/8	3/4	---	---
B-B (Concrete Form, Ext.)	48	96	---	---	---	5/8	3/4	---	---
C (Repaired)-C (Underlayment, Ext.)	48	96	1/4	3/8	1/2	5/8	3/4	---	---
C-C (Sheathing, Ext.) Unsanded	48	96	5/16	3/8	1/2	5/8	3/4	---	---

[1] A tolerance of 1/32 (0.0312) in. over or under the specified width and/or length shall be allowed, but all panels, including overlays, shall be square within 1/8 (0.125) in. All panels shall be sawn so that a straight line drawn from one corner to the adjacent corner shall fall within 1/16 in. of panel edge.

[2] A tolerance of 1/64 (0.0156) in. over or under the specified thickness shall be allowed on sanded panels, and a tolerance of 1/32 (0.0312) in. on unsanded and overlaid panels.

[3] Minimum number of plies required for standard construction:
3 plies for 1/4-, 5/16-, and 3/8-in.
5 plies for 1/2-, 5/8-, and 3/4-in.
7 plies for 7/8- to 1 3/16-in.

[4] Sanded 2 sides, except C-C (Sheathing).

Note.—Any size panel conforming in all other respects to the various requirements of this standard shall be considered as conforming to this standard.

Table 6. Standard Stock Douglas Fir Plywood Sizes—Overlaid Plywood

Grade	Width (in.)[1]	Length (in.)[1]	Thickness (in.)[2]
A-A—High Density, Ext.	36	96	5/16 (3-ply)[3]
A-A—High Density, Ext.	48	96	3/8 (3-ply) 1/2 (5-ply) 9/16 (5-ply) 5/8 (5-ply) 3/4 (5-ply) 7/8 (7-ply) 1 (7-ply) 1 1/8 (7-ply)
B-B—High Density, Ext.	36 48	96	Same as for grade A-A, above.
B-B—High Density, Ext. (Concrete Form)	48	96	1/2 (5-ply) 9/16 (5-ply) 5/8 (5-ply) 3/4 (5-ply)
B-B—Medium Density, Ext.	36 48	96	Same as for grade A-A, above.
B-B—Medium Density, Ext. (Concrete Form)	48	96	1/2 (5-ply) 9/16 (5-ply) 5/8 (5-ply) 3/4 (5-ply)

[1]A tolerance of 1/32 (0.0312) in. over or under the specified width and/or length shall be allowed, but all panels, including overlays, shall be square within 1/8 (0.125) in. All panels shall be sawn so that a straight line drawn from one corner to the adjacent corner shall fall within 1/16 in. of panel edge.

[2]A tolerance of 1/64 (0.0156) in. over or under the specified thickness shall be allowed on sanded panels, and a tolerance of 1/32 (0.0312) in. on unsanded and overlaid panels.

[3]Number of plies refers to veneers. Resin-impregnated surfaces are not included.

Note.—Any size panel conforming in all other respects to the various requirements of this standard shall be considered as conforming to this standard.

reinspection report if the shipment is more than 5 percent below grade, or if it contains more than 1 percent of mismanufactured panels containing defects such as short core, lapped core, blisters, delamination, etc., which render the panel unfit for normal use. The buyer need not accept such defective panels shipped as any standard grade listed in this Commercial Standard.

7.3 If reinspection establishes the shipment to be 5 percent or less below grade, and to contain 1 percent or less of mismanufactured panels, the buyer pays the cost of reinspection and pays for the shipment as invoiced.

8. GRADE MARKING AND CERTIFICATION

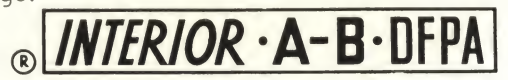
8.1 In order to assure the purchaser that he is getting Douglas fir plywood of the grade specified, producers may, individually or in concert with their trade association or inspection bureau, issue certificates with each shipment; or grade-mark each panel as conforming to the standard.

8.2 The following sets forth the grade marking and certification symbols adopted by the Douglas Fir Plywood Association to preserve the high standards of quality herein recorded. The grade-mark symbols on the plywood are to insure that the **ultimate consumer** receives the kind of plywood specified.

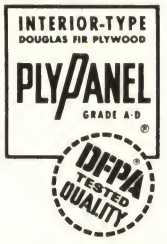
8.3 To identify the various grades within the Interior type Douglas fir plywood, these grademarks are stamped or branded on all standard size panels:

(a) Grade A-A, Int. panels are stamped on the edge:

(b) Grade A-B, Int. panels are stamped on the edge:

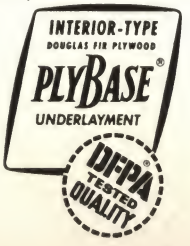


(c) "Plypanel," grade A-D, Int. panels are stamped on the back:



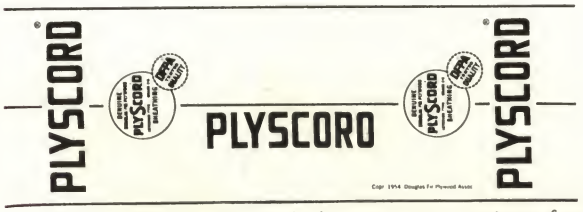
(d) Grade B-D, Int. panels are stamped, usually on the edge:

(e) "Plybase" Underlayment, grade C (rep'd)-D, Int. panels are stamped on the back:



(f) "Plyscord," grade C-D, Int. panels are stamped either on the face or back:

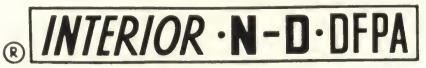
Many Association mills also use across the entire face of a 4-ft. by 8-ft. "Plyscord" sheathing panel at each end the following:



(Lines in the above label represent scorings for nailing to framing members at 16-, 24-, 32-, or 48-in. centers.)

(g) "Plyform," grade B-B, Int. panels are stamped on one face:

(h) Natural Finish One Side, grade N-D, Int. panels are stamped on the edge:



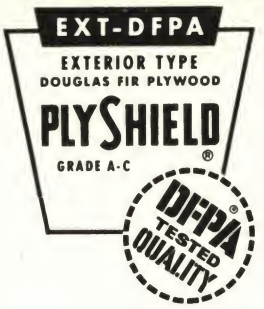
(i) Natural Finish Two Sides, grade N-N, Int. panels are stamped on the edge:

8.4 To identify the Exterior type of Douglas fir plywood, the symbol "EXT-DFPA" is branded or stamped on the edge of each standard size panel. The various grades within the Exterior type are additionally identified by the following grade marks branded or stamped on the edge of each standard size panel.

(a) Grade A-A, Ext. panels are stamped on the edge:

(b) Grade A-B, Ext. panels are stamped on the edge:

(c) "Plyshield," grade A-C, Ext. panels are stamped on the edge and may also be stamped on the back:

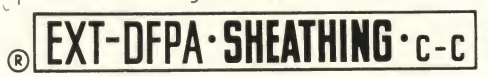


OPTIONAL BACK STAMP

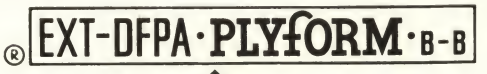
(d) Utility, grade B-C, Ext. panels are stamped on the edge:

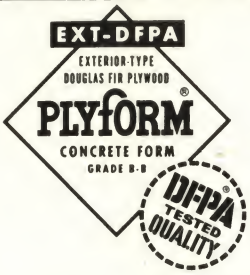
(e) Grade C (rep'd)-C, Underlayment, Ext. panels are stamped on the edge:

(f) Sheathing, grade C-C, Ext. panels are stamped on the edge:



(g) Concrete Form, grade B-B, Ext. panels are stamped on the edge and may also be stamped on the back:

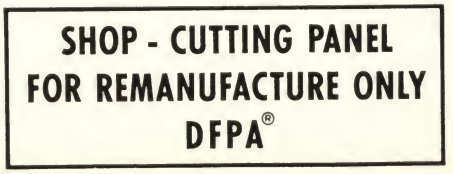




OPTIONAL BACK STAMP

(h) Each standard size overlaid panel also carries the symbol "EXT-DFPA" branded on the edge to indicate it is of Exterior type.

8.5 **Shop-cutting panel—for remanufacture only.** —Panels stamped as shown below have been rejected as not conforming to grade requirements of standard grades in this Commercial Standard. However they may be especially suitable, through appropriate cutting, for various industrial or other uses. They are analogous to certain shop grades of lumber, also intended for cut up.



Delaminated or blistered panels are not considered as coming within the category covered by this stamp.

Certificate of Inspection

APPLIES ONLY TO DFPA GRADEMARKED PANELS

IT IS HEREBY CERTIFIED that the plywood identified below and **marked with a GRADE-TRADEMARK of the DOUGLAS FIR PLYWOOD ASSOCIATION** (D.F.P.A.), was manufactured in accordance with the grade specifications established by the U. S. Department of Commerce as Commercial Standard CS 45-55, by the

JOHN DOE PLYWOOD CO.

ORDER NO._____

CAR NO._____

DATE_____

whose production bearing any of the Association grade-trademarks (see reverse side) is under the supervision of the Inspection Department of the DOUGLAS FIR PLYWOOD ASSOCIATION.

Signed for DOUGLAS FIR PLYWOOD ASSOCIATION

Managing Director

AUTHORIZED SIGNATORY

*Subscribed and declared to before me, the undersigned, a Notary Public in and for the state of*_____*by the above named authorized signatory personally known to me as the person signing the above certificate.*

Notary Public

*Dated*_____*19*____

SEE REVERSE SIDE OF THIS CERTIFICATE FOR MINIATURE FACSIMILES OF GRADE-TRADEMARKS BELONGING TO SAID ASSOCIATION

REGISTERED GRADE-TRADEMARKS OF DOUGLAS FIR PLYWOOD ASSOCIATION

Grade-trademarks, reproduced below, identify panels both as to TYPE of bond between plys and appearance GRADE of outer plys or veneers, as stipulated in U. S. Commercial Standard CS45-55.

EXTERIOR-TYPE

EXT-DFPA·A-A
Grade A veneer on both faces.

EXT-DFPA·A-B
Grade A veneer on face of panel—Grade B on back.

EXT-DFPA·PLYSHIELD·A-C
Grade A veneer on face—Grade C on back.

(OPTIONAL Back Stamp)

EXT-DFPA·UTILITY·B-C
Grade B veneer on face—Grade C on back.

EXT-DFPA·UNDERLAYMENT
Grade C (repaired) veneer on face—Grade C on back.

EXT-DFPA·SHEATHING·C-C
Grade C veneer on both faces of panel.

EXT-DFPA·PLYFORM·B-B
Grade B veneer on both faces of panel.

(OPTIONAL Back Stamp)

INTERIOR-TYPE

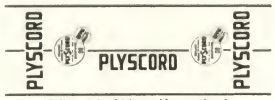
INTERIOR·A-A·DFPA
Grade A veneer on both faces.

INTERIOR·A-B·DFPA
Grade A veneer on face—Grade B on back.

Grade A veneer on face—Grade D on back.

Grade C (repaired) veneer on face—Grade D on back.

Grade C on face—Grade D on back.



(Full panel width marking on face)

INTERIOR·N-D·DFPA
Special "natural finish" veneer on face with D back.

INTERIOR·N-N·DFPA
Special "natural finish" veneer on each face.

Grade B on both faces of panel—Grade C for inner plys.

Douglas Fir Plywood Association,
Tacoma 2, Washington

8.6 The Douglas Fir Plywood Association maintains a quality control and an inspection service for the careful grading of its members' products. The certificate of inspection which applies **only** to Association grade-marked plywood, and which is used with carload lots, is to insure that the distributor or first unloading buyer receives plywood of the type and grade specified. A facsimile of the Association certificate is shown in figures 4 and 5.

9. METHOD OF ORDERING

9.1 The established procedure in specifying size and grade of plywood is to name the number of plies, width, length, grade, moisture resistance, finished thickness, and whether sanded or unsanded.

9.2 Width always refers to distance across the grain of the face plies; length refers to the distance along the grain. Width should always be specified first.

9.3 If, for example, you require 100 pieces of plywood 1/4 in. thick, 48 in. wide, and 96 in. long, for interior or semi-exposed applications, one side of which is to be nailed against a wall where it will not show, but the other side to be exposed to view and painted, this material should be ordered as follows:

> Douglas Fir Plywood: 100 pcs., 3-ply, 48 in. by 96 in., Interior Type, A-D Grade, Sanded 2 Sides to 1/4 in. thickness.

9.4 For most uses, sanded panels are desirable, but there are occasional uses where unsanded panels, of an **A-D** or other grade, are satisfactory. Such panels should be specified unsanded.

9.5 For special types of service, special features may be desirable in plywood panels, such as omission of oiling for concrete-form panels, extra thick faces for certain architectural treatments, etc. In such cases, the special treatment or feature should be stated after the standard specification. For example, if special features are desired in an Exterior type **A-A** panel of 3/8 in. thickness, the order should read:

> Douglas Fir Plywood: 100 pcs., 3-ply, 48 in. by 96 in., Exterior Type, A-A Grade, Sanded 2 Sides to 3/8 in. thickness. (Add further special requirements.)

9.6 When ordering overlaid plywood, High Density Overlay, Medium Density Overlay, or overlaid plywood Concrete Form should be specified. The number of pieces, size, and thickness are noted in the same way as for other kinds of plywood. Special requirements, such as High Density **A-A,** surfaced 1 side only, or special weights of surfacing material, should be stated after the standard specification.

10. NOMENCLATURE AND DEFINITIONS

Back.—The side reverse to the face of the panel.

Borer Holes.—Voids made by wood-boring insects or worms.

Centers.—See "Cores".

Check.—A partial separation of veneer fibers, usually small and shallow, running parallel to the grain of the wood, caused chiefly by strains produced in seasoning.

Cores.—Cores or centers are the innermost layer in plywood construction.

Crossbanding.—Veneer used in the construction of plywood with five or more plies. In 5-ply construction it is placed at right angles between the core and faces.

Defects, open.—Open checks, open splits, open joints, open cracks, loose knots, and other defects interrupting the smooth continuity of the panel surface.

Exterior Type.—Refers to the type of plywood intended for outdoor or marine uses. This type is bonded with adhesives, affording the ultimate in water and moisture resistance. (See paragraphs 4.4 and 4.6.) There are several grades within this type.

Face.—The better side of a panel in any grade calling for a face and a back; also, either side of a panel where the grading rules draw no distinction between faces. The quality of the face and back determines the grade of panel within either the Exterior or Interior type.

Heartwood.—The darker-colored wood occurring in the inner portion of the tree, sometimes referred to as "heart".

Interior Type.—Refers to the type of plywood intended for inside uses and for construction applications where subjected to occasional wetting or deposits of moisture. (See paragraphs 4.4 and 4.5.) There are several grades within this type.

Knot.—Cross section of a branch or limb whose grain usually runs at right angles to that of the piece in which it is found.

Knotholes.—Voids produced by the dropping of knots from the wood in which they were originally embedded.

Lap.—A condition where the veneers used are so misplaced that one piece overlaps the other rather than making a smooth butt joint.

Patches.—Insertions of boat-shaped sound wood glued and placed into panels from which defective portions have been removed.

Pitch Pocket.—A well-defined opening between rings of annual growth, usually containing, or which has contained, more or less pitch, either solid or liquid.

Pitch Streak.—A well-defined accumulation of pitch in a more or less regular streak.

Plugs.—Sound wood, usually circular, for replacing defective portions which have been removed. Plugs usually are held in veneer by friction only until veneers are bonded into plywood. Synthetic plugs are of fiber and resin aggregate; they are used to fill openings and provide a smooth, durable surface.

Sapwood.—The lighter-colored wood occurring in the outer portion of the tree, sometimes referred to as "sap".

Shim.—A long, narrow repair not more than 3/16 in. wide.

Split.—Complete separation of veneer fibers parallel to grain, caused chiefly by manufacturing process or handling.

Streaks.—See "Pitch streak".

Torn Grain.—A marked leafing or separation on veneer surface between spring and summer wood.

Veneer.—Thin sheets of wood.

Veneer Patches. — Patches inserted in veneer sheet before panel is assembled for pressing.

60/60, 65/65, 93/93, etc.—Such optional symbols may be used by manufacturers of overlaid plywood to indicate the weight of the overlay in pounds per 1,000 sq. ft. on each side of the panel. The weight of the overlay includes resin and carrier sheet (or sheets) together, before pressing.
